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## (54) ASSEMBLY FOR A DISC BRAKE

(71) We, TOKICO LTD., a Japanese body corporate of 6-3, Fujimi 1-chome, Kawasaki-ku, Kawasaki-shi, Kanagawa-ken, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to an assembly for a disc brake, the assembly being of the type including an hydraulic cylinder having two open ends, two pistons working in the cylinder and defining a pressure chamber therebetween, one of the pistons being adapted to apply one friction pad of the brake against one surface of a rotatable disc of the brake and the other piston being adapted to apply, through a yoke, the other friction pad of the brake against the other surfaces of the disc, and seal members disposed in the inner periphery of the cylinder and engaging respectively with the outer periphery of the pistons.

In the disc brakes using an assembly of the aforementioned type, when either of the pistons has been moved inadvertently into the cylinder to override the seal member, the seal member will be damaged by the piston when, thereafter, the piston is forcibly returned.

An object of the present invention is to provide an assembly for a disc brake eliminating the shortcoming of the prior art assembly of the above type; and according to the present invention, there is provided in an assembly of that type, a device preventing excess movement of pistons inwardly of the cylinder.

One embodiment of the present invention will be described in connection with the accompanying drawings, in which:-

Figure 1 is a longitudinal cross-section of the cylinder device of a conventional assembly of the type concerned, including a cylinder having two open ends, and two pistons

working therein;

Figure 2 is an enlarged partial view of the cylinder device of Figure 1 and shows a condition when one of the pistons is moved excessively into the cylinder;

Figure 3 is a plan view of an annular stopper provided in an embodiment according to the present invention;

Figure 4 is a cross-sectional view taken along line IV-IV in Figure 3;

Figure 5 is an enlarged partial cross-sectional view of a cylinder device similar to that of Figure 1 but incorporating a stopper of Figures 3 and 4 according to the present invention; and

Figure 6 is a view similar to Figure 5 and showing a condition when the stopper is in abutment with the cylinder.

In the cylinder device as shown in Figure 1, a cylinder 1, having two open ends, receives two pistons 2 and 3 slidably therein; and an oil chamber 4 is defined between the adjacent ends of the pistons 2 and 3. One of the pistons presses directly on one of the friction pads (not shown) of the brake to move it toward one surface of the rotatable disc (not shown) at the brake when oil under pressure is supplied into the chamber 4, and the other piston moves a yoke (not shown) in the opposite direction to apply the other friction pad (not shown) against the other surface of the disc. Outer ends of the pistons 2 and 3 provide respectively stepped small diameter portions 2a and 3a, and outer end portions of the cylinder 1 provide respectively annular grooves 1a and 1b. The small diameter portions 2a and 3a and the annular grooves 1a and 1b are adapted to receive opposite ends of dust covers (not shown) which prevent ingress of dust, water or the like into the cylinder device.

Annular grooves 5 and 6 are formed in the cylinder 1 at the opposite end portions thereof for receiving respectively annular seal rings 7 and 8 therein. The bottom sur-

faces of the grooves 5 and 6 are tapered respectively in the inward direction of the cylinder 1; and the seal rings 7 and 8, having a generally rectangular cross-section as shown clearly in Figure 2, are received in the grooves 5 and 6 respectively to seal the chamber 4 from the outside of the cylinder 1 during sliding movement of the pistons 2 and 3 in the cylinder 1. The seal rings 7 and 8 act to attain so-called roll-back effects by which the pistons 2 and 3 will retract into the cylinder 1 by a small amount when pressure in the chamber 4 is released so as to withdraw the pistons to the normal clearance between the friction pads and the disc when the brake is released.

In the conventional cylinder device as described above, workers working in assembling the device or in repairing, such as exchanging friction pads or the like, are prone to push either of the pistons 2 or 3 excessively into the cylinder 1 such that the piston 2 or 3 will override the corresponding seal ring 7 or 8 as shown in Figure 2.

Besides, if one of the pistons connected to the yoke is moved outward of the cylinder 1 when an oil passage communicating with the chamber 4 is closed, the other piston will move inward of the cylinder 1 excessively according to vacuum pressure generated in the chamber 4. Such outward movement of the yoke is sometimes observed when a brake assembly is transported as a unit and owing to vibrations of the yoke for instance.

In any case, when either of the pistons 2 or 3 is moved excessively into the cylinder 1 to override the corresponding seal ring 7 or 8 as shown in Figure 2, it is very difficult to pull out the piston without damaging the seal ring. The inner edge of the seal ring will be broken by the outer end portion 2b or 3b of the piston, thereby causing oil leakage. Oil leakage in braking system which constitutes one of essential safety devices of a vehicle will sometimes cause tragic results.

The present invention aims to eliminate the aforementioned drawback by providing an annular stopper disposed on the outer periphery of each of the pistons and being engageable with the cylinder when the piston is moved into the cylinder by a predetermined amount.

One embodiment of the present invention will be described referring to Figures 3 to 6.

Figures 3 and 4 show an annular stopper 9 employed in the embodiment:

The stopper 9 is adapted to fit on the outer periphery of stepped small diameter portion 2a or 3a of the piston 2 or 3, and the cross-section of the stopper 9 is shown in Figure 4.

In Figure 5, the stopper 9 is tightly fitted on the stepped small diameter portion 3a of the piston 3, and one end 10a of a dust boot 10 is attached to the stopper 9 and the other end 10b of the dust boot 10 is fitted in the

groove 1b of the cylinder 1. A retaining ring 11 retains the end 10b in the groove 1b.

The annular stopper 9, the embodiment is fitted on the stepped small diameter portion of the piston, but such a formation need not be provided and the stopper may be fitted on the outer periphery of a full diameter portion of the piston. Further, it is lodged in place merely by being tightly fitted on to the outer periphery of the small diameter portion of the piston, but it is possible to provide a retaining device for retaining the stopper positively in its position, such as a shallow annular groove formed in the outer periphery of the small diameter portion 3a.

When the piston 3 is moved into the cylinder 1 by a predetermined distance, the stopper 9 will engage with the outer end of the cylinder 1, as shown in Figure 6, to limit the inward movement of the piston 3, thus excessive inward movement of the piston 3 is prevented and the seal ring 8 subsequently will not be damaged. It will be appreciated that a stopper similar to the stopper 9 is also fitted on the piston 2.

As described heretofore in detail, the present invention makes it possible to prevent excessive inward movement of the piston by providing a simple annular stopper on the outer periphery of the piston, thus, it is possible to prevent damage of seal rings which might be caused in assembling, disassembling or transporting the disc brake.

Further, the annular stopper can be utilized to attach one end of a dust cover thereon, and since the stopper acts to limit the movement of the piston the dust cover will not be deformed excessively, thereby preventing damage of the dust cover.

#### WHAT WE CLAIM IS:-

1. An assembly for a disc brake the assembly comprising an hydraulic cylinder having two open ends, two pistons working in the cylinder and defining a pressure chamber therebetween, one of the pistons being adapted to apply one friction pad of the brake against one surface of a rotatable disc of the brake and the other piston being adapted to apply, through a yoke, a second friction pad of the brake against the other surface of the disc, and seal members disposed in the inner periphery of the cylinder for engaging respectively with the outer periphery of the pistons, wherein, an annular stopper is mounted on the outer end of each piston for engaging with the cylinder when the piston is moved into the cylinder by a predetermined amount so as to prevent the piston from overriding a seal member therefor.

2. An assembly as claimed in claim 1, wherein a stepped small diameter portion is formed on the outer end portion of each piston, and the respective annular stopper is mounted on the outer periphery of the small

diameter portion of the piston.

3. An assembly as claimed in claim 1, wherein each stopper is mounted on an unreduced diameter portion of the piston.

5 4. An assembly as claimed in claim 1, 2, or 3, wherein each stopper is lodged in place merely by being tightly fitted on the respective part of the piston.

10 5. An assembly as claimed in claim 1, 2, or 3, wherein the part of each piston on which the respective stopper is mounted comprises an annular groove forming a lodgement for the stopper.

15 6. An assembly as claimed in any of the preceding claims, wherein each seal member is formed of a seal ring having a generally rectangular cross-section and being received in an annular groove formed in the inner circumference of the cylinder, the bottom surface of said groove being tapered in inward direction of the cylinder.

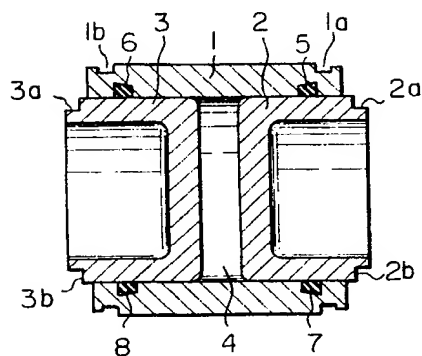
20 7. An assembly for a disc brake, substantially as hereinbefore described with reference to Figures 3 to 6 of the accompanying drawings.

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Fig. 1 PRIOR ART



*Fig. 2* PRIOR ART

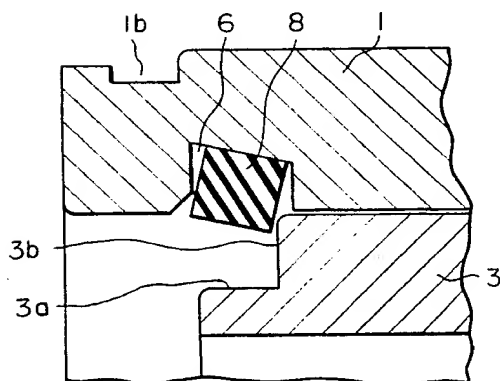


Fig. 3

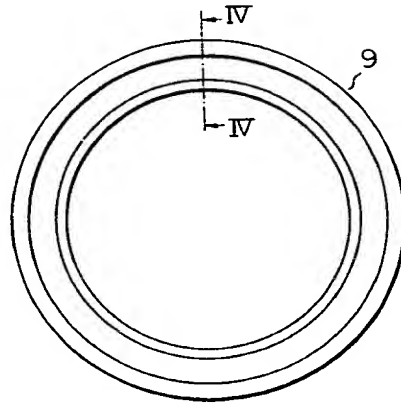


Fig. 4



Fig. 5

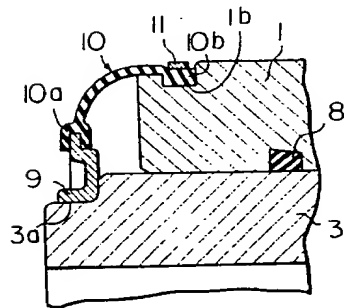
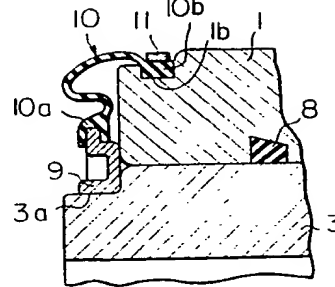


Fig. 6



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